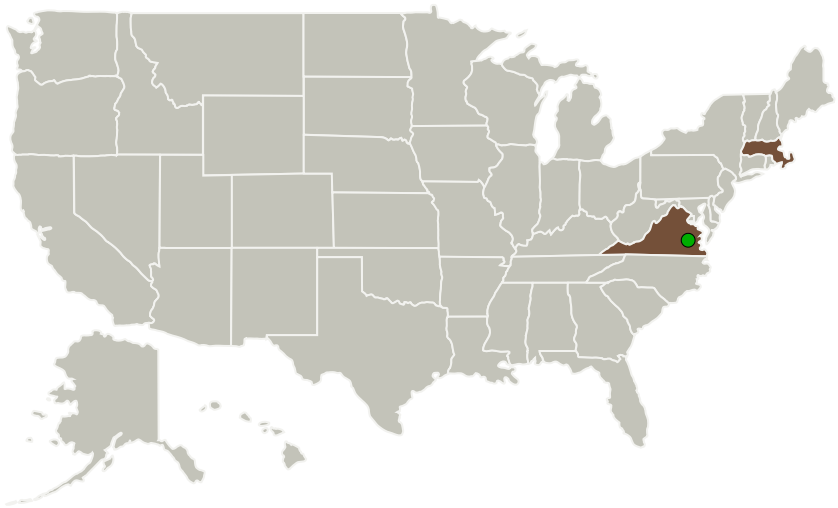
Non-Catalytic Nanocomposite Based Self-Healing Material for Multifunctional Composite, Phase I

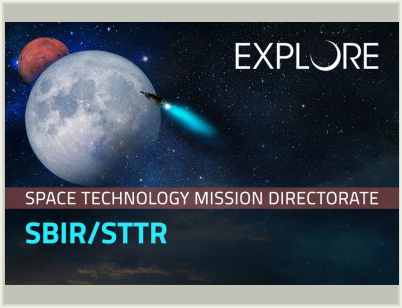
Completed Technology Project (2011 - 2011)

Project Introduction

NASA seeks new materials and systems for the mitigation of structural damage, and new concepts for the activation of healing mechanisms to improve structural durability and enhance safe operation of aerospace structural systems. Nanotrons Corporation proposes to develop advanced multifunctional carbon fiber-reinforced polymer (CFRP) composites with built-in non-catalytic nanocomposite based self-healing microcapsules. The proposed self-healing approach integrates high performance functionalized carbon nanotube (CNT) nanofillers, reactive monomer solution, non-catalytic curing mechanism, and mass-production self-healing microcapsules. By uniformly dispersing these nanocomposite-based self-healing microcapsules throughout the CFRP composite matrix, self-healing multifunctional composite materials will be fabricated. The resulting materials should selectively repair the damaged areas at ambient conditions without catalysts. Nanotrons' proposed novel multifunctional CFRP composites could heal the damaged area over 90% of the original strength. Added benefits are that the addition of self-healing microcapsules will increase fracture toughness of the matrix polymer and the incorporated CNT nanofillers will improve electrical conductivity and EMI/RF shielding performance of the healed CFRP composites. These features are unattainable from existing systems. Nanotrons' proposed non-catalytic nanocomposite-based self-healing microcapsules embedded in multifunctional CFRP composites can be economically scaled up for manufacture. This Phase I program will demonstrate the feasibility of our proposed self-healing approach.

Primary U.S. Work Locations and Key Partners





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Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
Nanotrons Technologies	Lead Organization	Industry	Woburn, Massachusetts
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138362)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanotrons Technologies

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

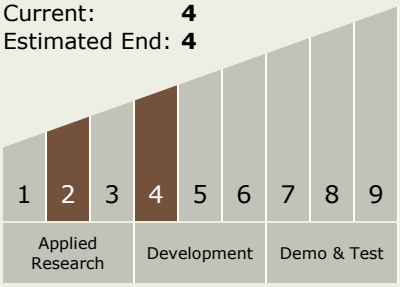
Carlos Torrez

Principal Investigator:

Je Kyun Lee

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.1 Infrastructure Optimization
    - TX13.1.7 Impact/Damage/Radiation Resistant Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System